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September 29, 2004

Michael A. Lewis
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**VIA ELECTRONIC FILING**

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: ET Docket No. 04-352 (*MBOA-SIG UWB Waiver Petition*)
ET Docket No. 04-151 (*Unlicensed Use of 3650-3700 MHz*)
ET Docket No. 04-186 (*Unlicensed Use of TV Broadcast Bands*)

Dear Ms. Dortch:

On September 28, 2004, a team of representatives from Motorola met with FCC staff from the Office of Engineering and Technology (OET) to discuss technical issues associated with a variety of FCC rulemaking proceedings listed above.

Attending the meeting from the OET were Ed Thomas, Bruce Franca, Julius Knapp, Fred Thomas, Jim Schlichting, Alan Scrime and Rashmi Doshi. Motorola participants were Steve Sharkey, Rob Kubik, Juan Santiago, David Borth, Tom D'Amico, Jim Krammen, Paul Odlyzko, John Barr, Mike Pellon, Paul Moroney, Josh Kiem, Rylan Jankauskas, Mike Pellon, Steve Kuffner, Stu Overby Gary Grube. Also in attendance were myself and Tom Dombrowsky, both from Wiley Rein and Fielding.

With regard to ET Docket No. 04-352 (*MBOA-SIG UWB Waiver Petition*), Motorola presented and discussed the information contained in the attached slides. The information discussed is reprised in Motorola's comments that are being filed separately today.

With regard to ET Docket No. 04-151 (*Unlicensed Use of 3650-3700 MHz*) Motorola discussed its recommendation that the FCC should consider this band for licensed mobile use. This recommendation was fully discussed in comments and reply comments filed by Motorola in this proceeding.

Finally, with regard to ET Docket No. 04-186 (*Unlicensed Use of TV Broadcast Bands*) Motorola presented the attached slide presentation, including Motorola's belief that use of the TV white space is feasible and desirable, and reviewing preliminary analysis with respect to the impact of out-of-band emissions and portable unlicensed units in certain situations.

Pursuant to Section 1.1206(b)(2) of the Commission's rules, 47 C.F.R. §1.1206(b)(2), one copy of this letter is being filed electronically for inclusion in the public record of these proceedings. If you have any questions regarding this filing, please contact me at the above number.

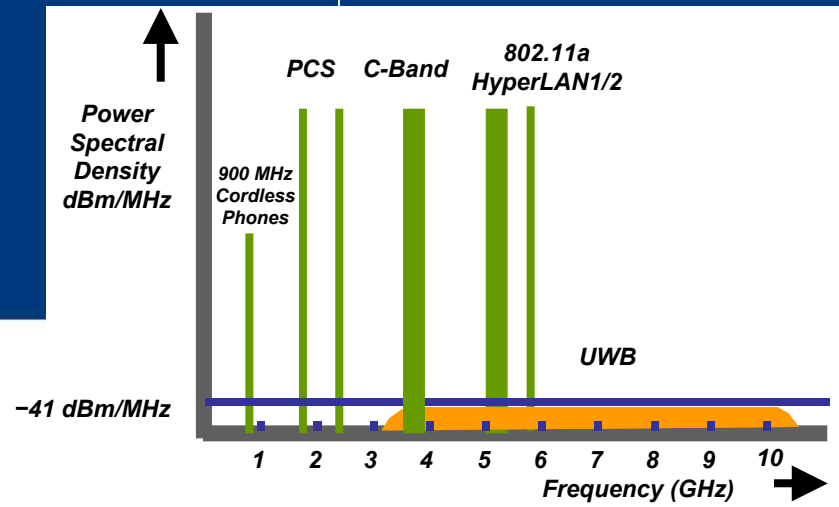
Sincerely,

/S/ Michael A. Lewis
Michael A. Lewis
Engineering Consultant
Wiley Rein & Fielding

Counsel for Motorola, Inc.

cc: Meeting Participants

# Motorola's UWB Perspective




John R. Barr
Corporate Standards
John.Barr@Motorola.com

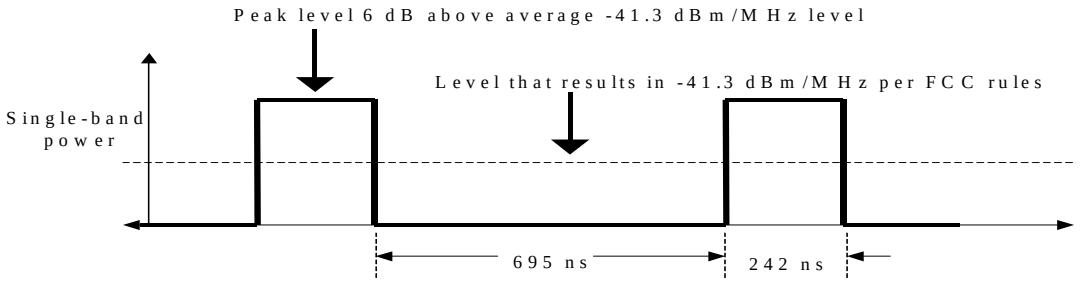
September 28, 2004

# Regulatory Perspective

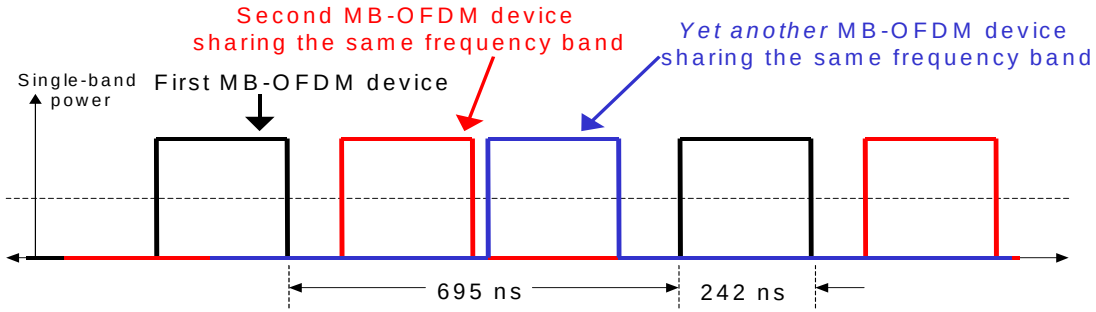
- FCC UWB rules approved February 2002
  - **World wide regulatory approval moving slower due to interference concerns**
- Motorola believes the DS-UWB waveform can obtain world wide regulatory approval using tightly enforced FCC rules:
  - **Interference testing results**
  - **Analysis of ITU TG1/8 concerns**
- Motorola and others supporting China UWB Forum to promote regulatory rules in China based on FCC rules.
- NiCT, Motorola and Freescale helping to draft regulatory rules in Japan.
- Motorola and others supporting ITU TG1/8 committee to establish ITU recommendation supporting regulatory rules based on FCC rules.
  - **No spectral shaping or expensive frequency mapping required**
  - **Interference testing results**

# MB-OFDM Interference Issue

- MBOA SIG waiver petition suggests this waveform is acceptable because the transmitter is quiescent for most of the period:




- However, protocol aggregation allows other devices sharing the channel to transmit during the quiescent period using a different Time Frequency Code. The MBOA SIG has proposed synchronization between devices to take advantage of the quiescent period[1]. This could cause a 6 db increase above the FCC's required -41.3 dBm PSD level.




[1]IEEE document 802.15-03/0350r0, September, 2003

# Conclusion

- Motorola is developing products for home video and mobile phone applications
- Tight enforcement of current FCC regulatory rules should satisfy world wide regulatory requirements
- Motorola is supporting application of FCC rules within the ITU and separately in China and Japan.
- Motorola does not support the MBOA SIG's waiver petition due to interference issues.

# TV White Space NPRM Analysis

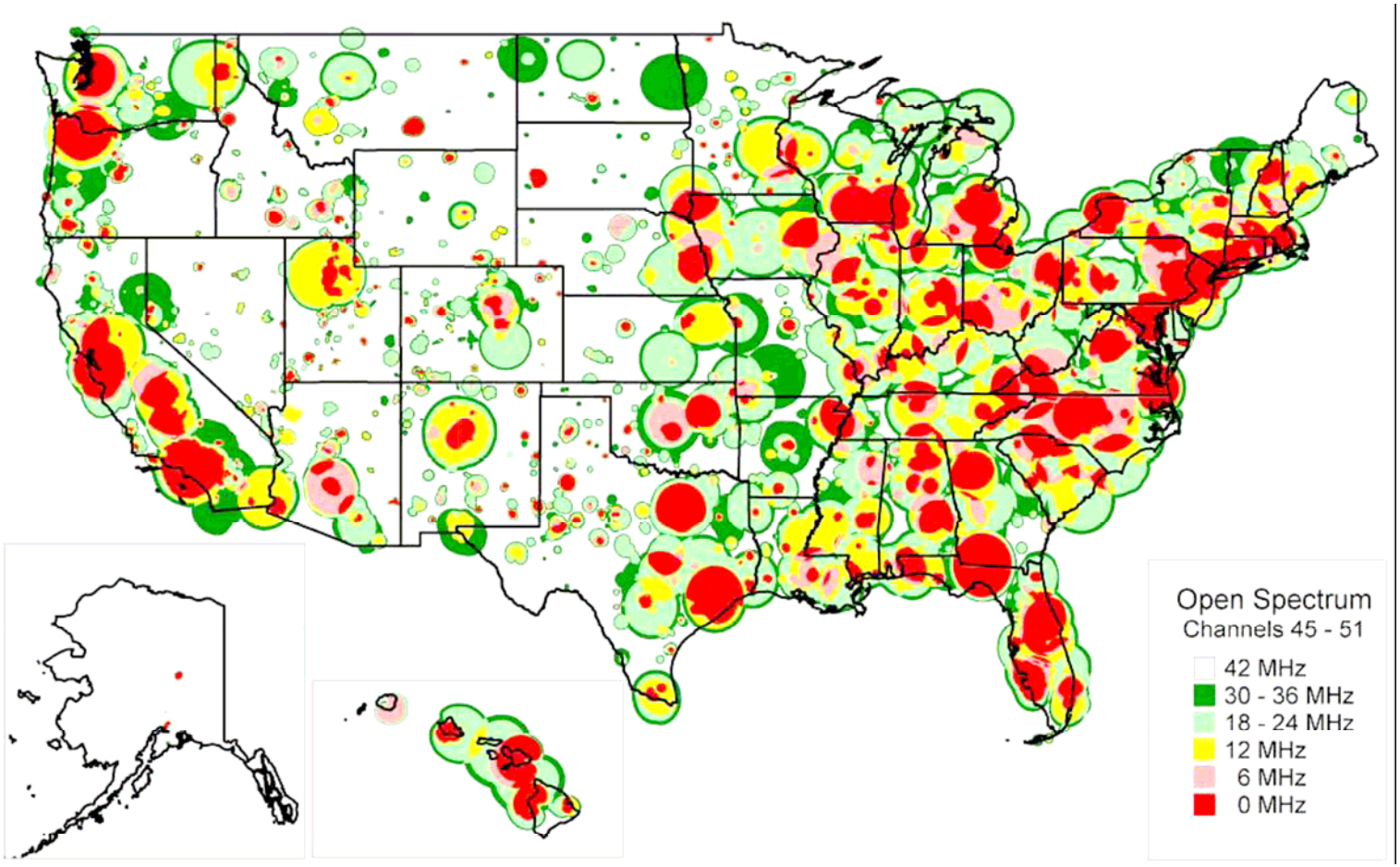

Federal Communications Commission
Office of Engineering and Technology
September 28, 2004

Motorola Canopy™ Wireless Broadband Products
Schaumburg, Illinois USA

# Overview

- We see great possibilities for cost-effective fixed Rural Broadband service in channels 21-51
  - 600 to 700 MHz has great propagation and indoor penetration characteristics
  - The upper TV channels are particularly attractive because there are more unused channels
- We are concerned with unlicensed operation in channels 14-20, where Public Safety is being used
  - The location-specific and database dependent use-mechanisms should provide adequate protection for non life-critical incumbents
  - However, we urge the FCC to avoid these bands and not subject Public Safety systems to accidental interference during initial unlicensed system deployment and validation
- We present preliminary analysis results of out-of-band emissions and adjacent-channel interference

# Spectrum Availability* Map: ch. 45 - 51




*Pre-DTV transition

# TV Interference Simulations

# Simulation Goals

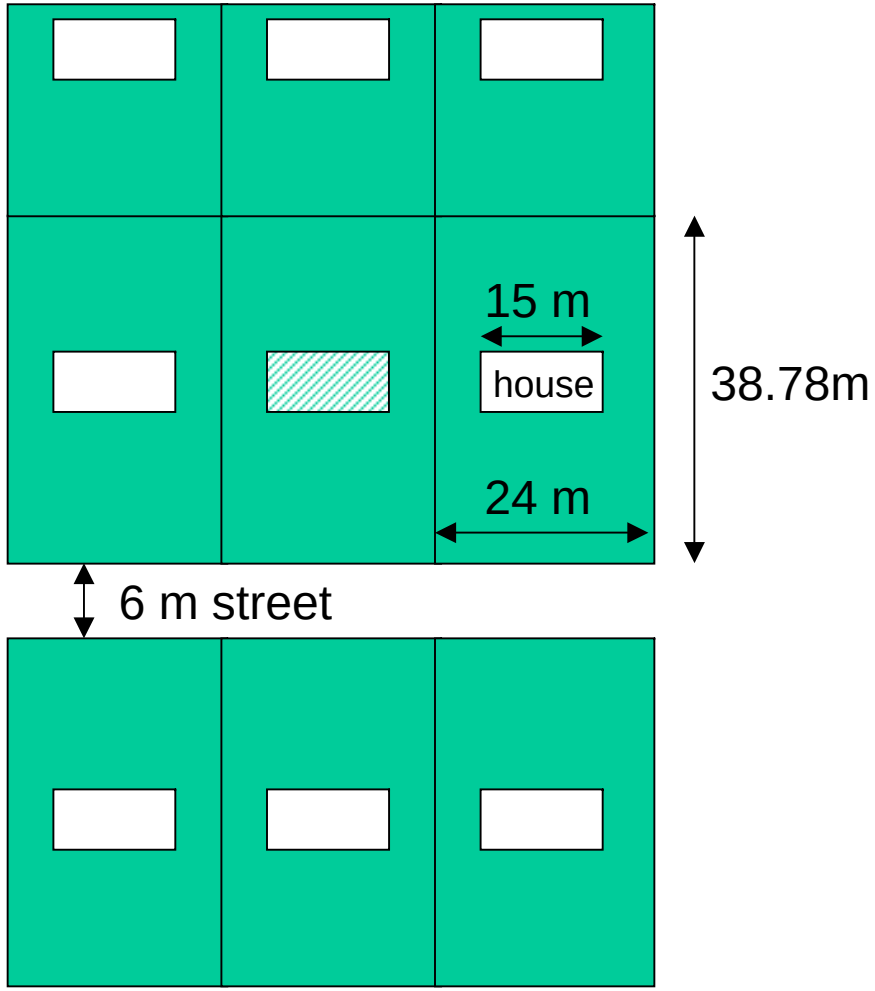
- Assess proposed FCC field strength limits
  - Use statistical analysis instead of worst case conditions
  - Determine acceptable out of band emission levels
  - Determine feasibility of adjacent channel operation within a contour
  - Propose appropriate separation distances and EIRP limits for out-of-contour operation

# TV Reception Interference Analysis

- Simulations are being performed to estimate the impact of unlicensed transmissions on TV operation
- One example is interference due to a nearest neighbor
  - A general probabilistic result is obtained that can be scaled to perform additional analyses of out of band emissions, adjacent channel level, TV front-end overload,…

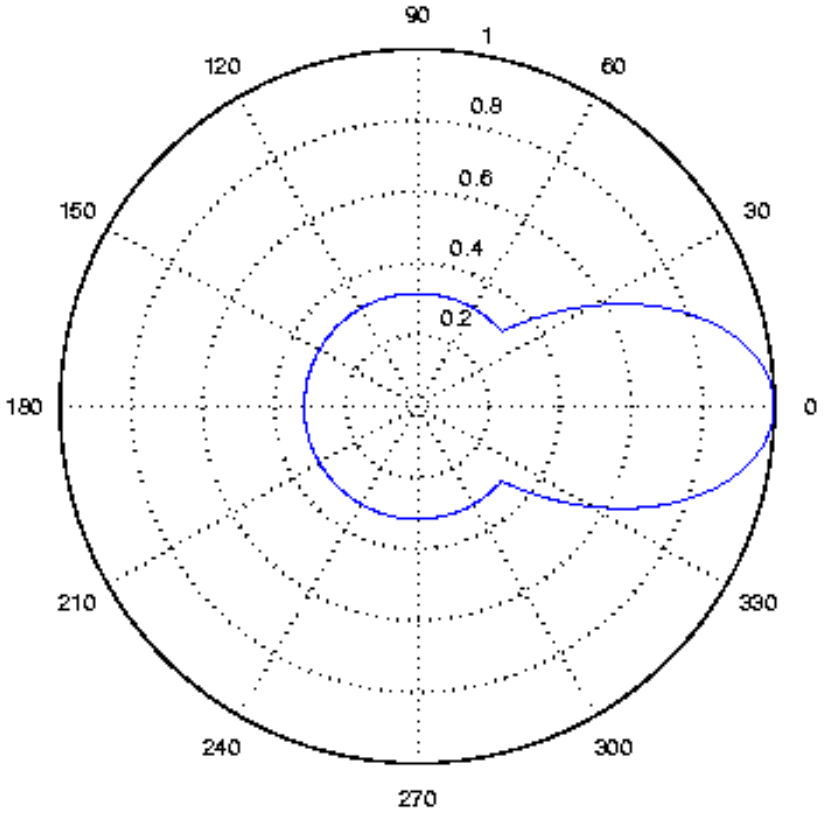
# Fixed/access nearest neighbor simulations

- Suburban 10k ft² lot size
- Cross hatched house has rooftop TV antenna
- One randomly selected neighbor has rooftop unlicensed antenna
- Antennas have random azimuth and location on house
- Antenna patterns per OET 69 for DTV
- Square law propagation
- No multipath considered



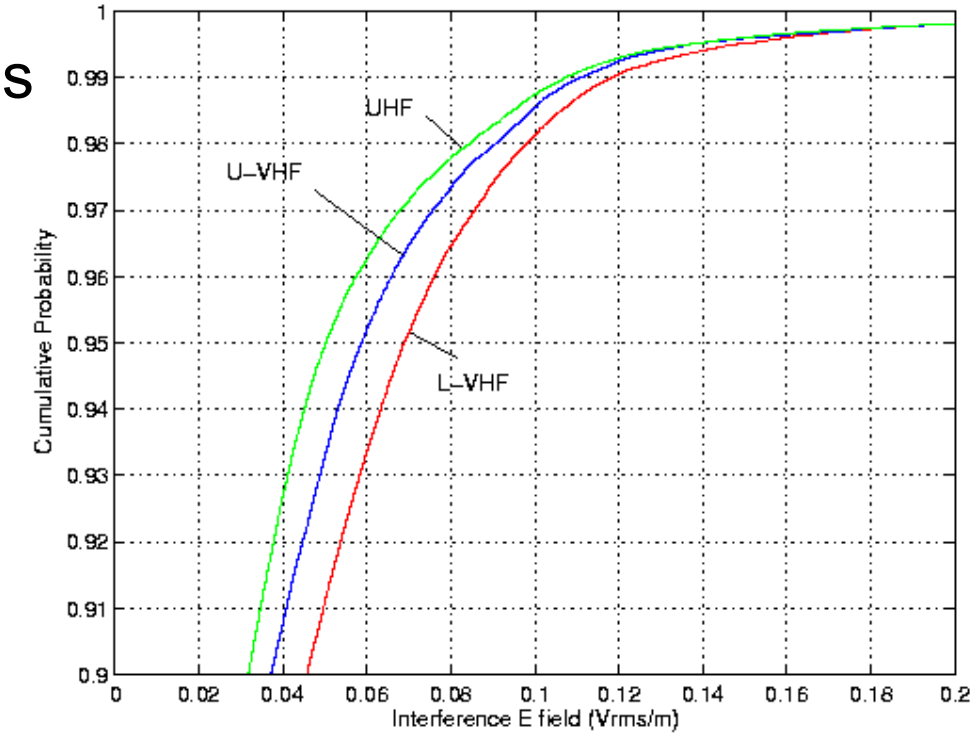
# OET 69 Antenna Pattern

- L-VHF
  - $\cos^4\theta$ to sidelobe level of -10dB
- Cross-pol pattern for unlicensed antenna is assumed to be uniform random between -10 and -20 dB



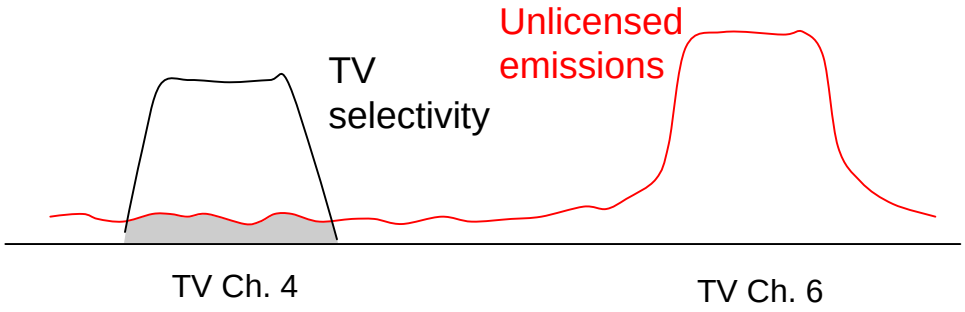
# Example Simulation Results

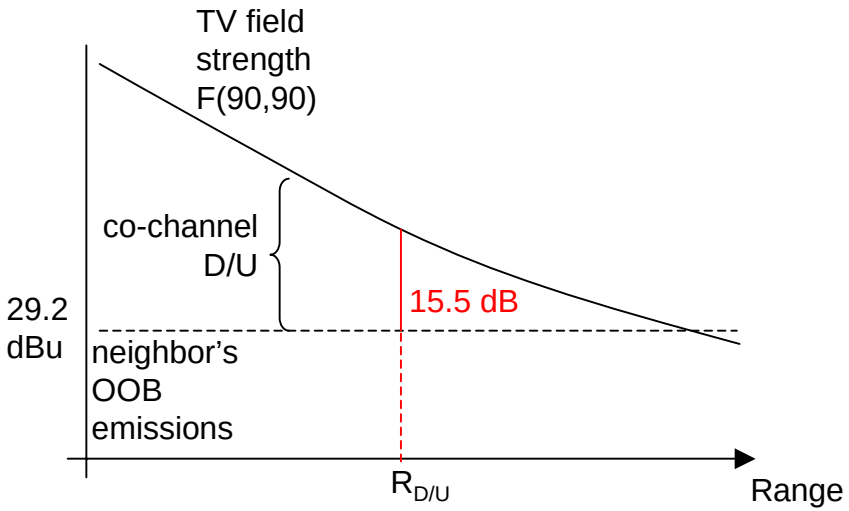
- 100k trials
- Co-polarized antennas randomly located and directed
- Normalized to 1W Tx EIRP
- L-VHF:
  - 90%: 45.5 mV/m
  - 95%: 68.5 mV/m
  - 99%: 118 mV/m
  - Note 1W @ 24m = 228 mV/m

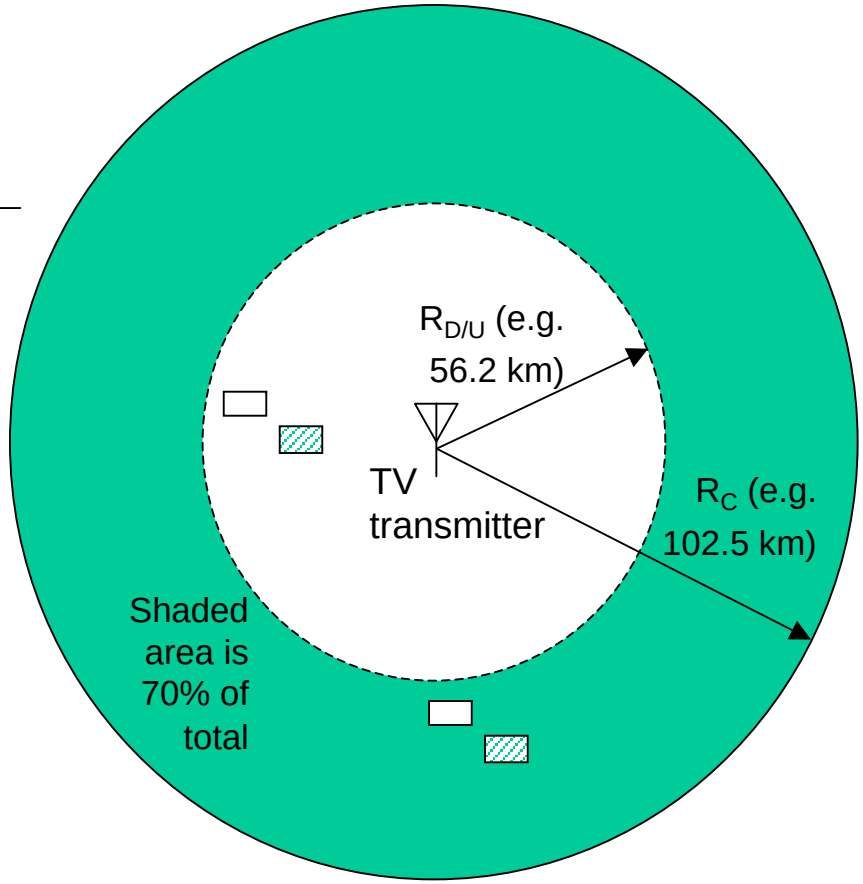


# Out of Band Emissions

# Preliminary Results: Proposed Out of Band Emission (OOBE) Limits Are Inadequate

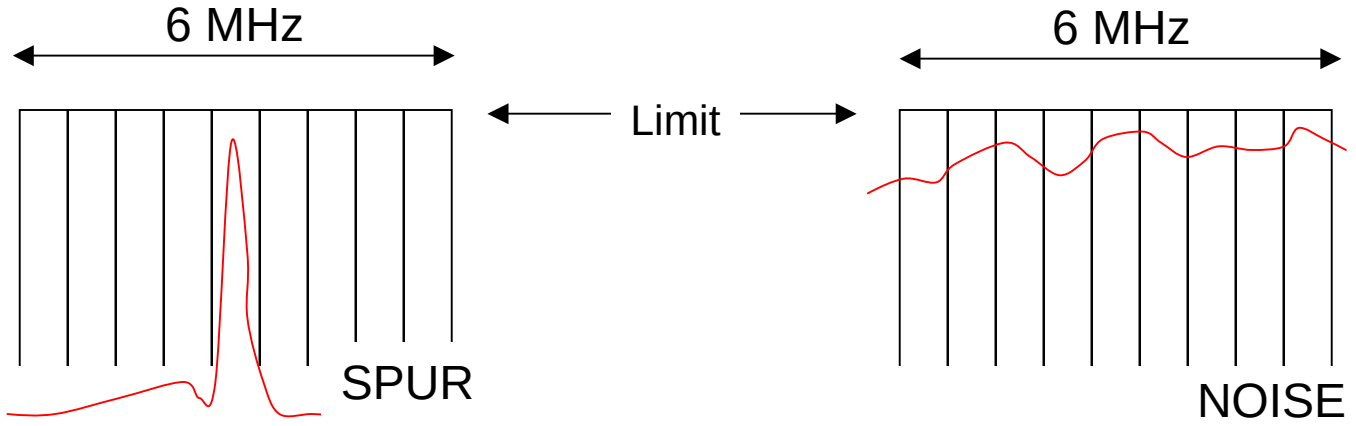


# Why are Part 15.209(a) Limits Inadequate?

- In most cases, 15.209(a) is adequate
  - Not typically two nearby, rooftop mounted antennas
  - Typically a spurious (e.g. harmonic) emission will not fall within the TV channel bandwidth
  - In cases when a spurious emission does fall within a bandwidth, usually only one spur is present
  - Usually even if one spur is present, it is not at or even near the limit



# Problems Areas Summary

| Band | $R_C$ (km) | Polari-zation | $R_{D/U}$ (km) | Problem area* (%) |
|---|---|---|---|---|
| L-VHF (180 nW) | 102.5 | co | 56.2 | 70 |
| | | cross | 70.6 | 52 |
| U-VHF (405 nW) | 97.7 | co | 66.0 | 54 |
| | | cross | 77.6 | 37 |
| UHF (720 nW) | 86.6 | co | 66.4 | 54 |
| | | cross | 72.9 | 29 |

*Under the stated assumptions for lot size and antenna patterns

- Conclusion
  - 15.209(a) levels are a problem over a substantial portion of the contour for the nearest neighbor condition
  - What levels would protect out to the contour?

# Acceptable OOB Emissions Summary

| Band | Contour (dBu) | Co-channel (dBu) | Pol. | 15.209(a) scaled E field (dBu) | Additional attenuation needed* (dB) |
|---|---|---|---|---|---|
| L-VHF | 28 | 5 | Co- | 29.2 | 24.2 |
| | | | Cross- | 21.8 | 16.8 |
| U-VHF | 36 | 13 | Co- | 31.3 | 18.3 |
| | | | Cross- | 24.9 | 11.9 |
| UHF | 41 | 18 | Co- | 32.6 | 14.6 |
| | | | Cross- | 27.3 | 9.3 |

*Under the stated assumptions for lot size and antenna patterns

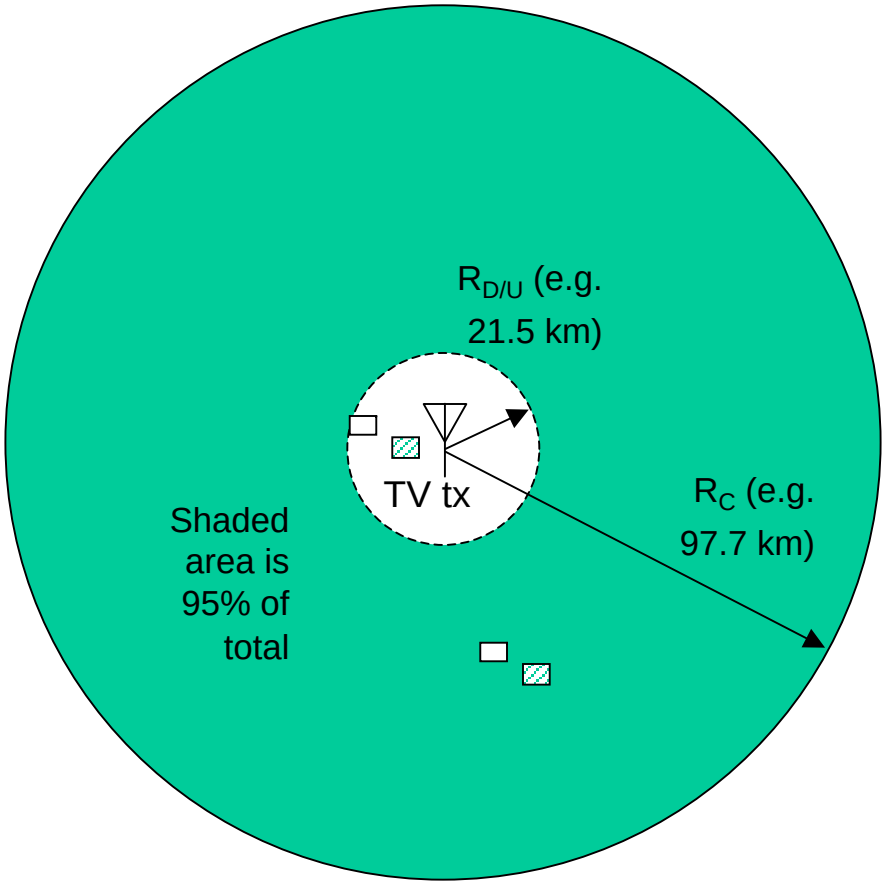
- Conclusion
  - Preliminary results indicate that additional attenuation below Part 15.209(a) is required to satisfy specified NPRM D/U values for co-channel

*Backup slides*

# Adjacent Channel Operation Within a Protected Contour

# Adjacent Channel Operation Within a Protected Contour Is Of Limited Utility

- Full power fixed/access operation on an adjacent channel within a protected contour will be possible over only a small portion of the contour
- U-VHF nearest neighbor example
  - F(90,90), -26dB D/U




*Backup slides*

# Portables Should be Required to Meet Adjacent Channel D/U Constraints

- In fringe areas, allowed adjacent channel power is low
- UHF example
  - Allowed EIRP = 2 mW for fixed/access analysis
    - This is 23 dB below the maximum 400 mW EIRP for portables
- Recommendation: Considering this low EIRP, we believe portables should also be required to meet the adjacent channel D/U constraints
  - Paragraph (h) of the proposed rules
- Possible Implementation: Limit portable EIRP for adjacent channel operation
  - Portable beacon could indicate max EIRP for each available channel

# Motorola Participation in IEEE802.18/802.22

# IEEE 802.18/802.22 Participation

- We have been regular participants in IEEE802.18 and 802.18-SG1
  - 802.18-SG1 was recently established by IEEE as new standard working group 802.22
- Motorola has been represented by two full-time employees and one consultant
- We have been active in the editing of the text and in simulations/analysis in the areas of transmit power control and spectral mask
- Monte Carlo simulation results will be shared with the group

# Conclusions

# Conclusions

- The availability of TV spectrum presents an exciting opportunity and we applaud the Commission and this proposal
- Based on preliminary analysis and assumptions, out of band emissions limits may be inadequate in some situations
- Adjacent channel operation within a protected contour will be of limited utility
- We continue to perform analyses of other proposed limits and to participate in IEEE802.18/22
- We believe, to protect Public Safety, that no unlicensed operations in channels 14 – 20 should be considered at this time